Fall Detection and Observation System over Linux Environment with IOT

N. SWETHA REDDY1, P. USHA2

1 PG Scholar, Dept of ECE, K G Reddy College of Engineering & Technology, Hyderabad, India, E-mail: nswetha49@gmail.com.
2 Asst Prof, Dept of ECE, K G Reddy College of Engineering & Technology, Hyderabad, India, E-mail: usha.bopparam@gmail.com.

Abstract: An enhanced fall detection system is proposed for elderly person monitoring that is based on-body sensor operating through consumer home networks and Internet of things (IoT). The on-body sensor which consists of accelerometer and cardio tachometer is used in this model. In this proposed system accelerometer measures overall vibration by means of using Signal Magnitude Vector and trunk angle. Here Signal Magnitude Vector is used to calculate the acceleration caused due to movement of the body with respect to xyz axis and trunk angle is used to calculate the posture of the elderly person during fall event, also these values will be updated over the web for caretaker view. Cardio tachometer is used to measure the pulse rate. A typical fall event ends with the person lying on the ground or leaning on walls, or furniture that will cause a significant change in trunk angle. In this case, it is desirable to consider changes on the trunk angle to detect whether the detected acceleration was due to a fall event. The set values of acceleration and pulse provides accuracy to the system avoiding false detection. This system is connected to GPS to measure the latitude and longitude values and GSM for communication purpose which is unique.

Keywords: Accelerometer, GSM, ARM 9, GPS.

I. INTRODUCTION

In recent years, many types of consumer electronic devices have been developed for home network applications. A consumer home network usually contains various types of electronic devices like sensors and actuators, so that home users can control them in an intelligent and automatic way to improve their quality of life. Some representative technologies to implement a home network are Ultra Wide Band, accelerometer. Accelerometer is suitable for consumer home networks because various sensors can be deployed to collect home data information in a distributed, self-organizing manner with relatively low power. The structure of projected fall detection system core structure relies on a Micro programmed Controller Unit (ARM9). The cardio tachometer (Heart Beat Sensor) and accelerometer are integrated on one single board, recording real time acceleration and heart beat. Each acceleration and heart beat information is first captured by analog-to-digital converter (ADC). Then, the digital signal is transmitted to the MCU for any process. The system is complemented with a customer interface designed to watch information in period. This system is designed such that it can help the elder persons who are residing in the house. Global Positioning System consists of a constellation of 21 satellites orbiting the earth every 12 hours at a height of approximately 10,900 nautical miles. Six orbital planes contain four satellites each and have an angle of inclination of 55 degrees with respect to the plane of the earth’s equator. Control of the system is aided by five globally located monitoring stations. These stations continuously evaluate the system performance and upload timing and health data which is then rebroadcast to the user. The gathered data is displayed over the web using inbuilt Ethernet over the intranet net network for access by the user.

II. ACCELEROMETER MODULE

An accelerometer is an electronic component that measures tilt and motion. ADXL345 is a small, thin, low power, 3-axis accelerometer with high resolution (13-bit) measurement at up to ±16 g. Digital output data is formatted as 16-bit two’s complement and is accessible through either a SPI (3- or 4-wire) or I2C digital interface. We have used I2C to connect ADXL345 to Raspberry Pi. The following functionalities are accomplished.

- An accelerometer chip attached to the user’s head detects the inclination of the head
- According to the inclination, the wheels of the wheelchair move forward or backward or turn to the right or left.

This module is thus aimed at improving the mobility of the chair and reducing the human effort required for the same. The motion of the head/neck is detected by the accelerometer and according to the direction and magnitude of motion, the wheelchair will move either forward or backward, or turns right or left. The corresponding range of accelerometer input is as shown in Table 2

<table>
<thead>
<tr>
<th>Function</th>
<th>Range of Accelerometer input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward</td>
<td>-1 ≤ x ≤ -0.2 and -0.2 ≤ y ≤ 0.2</td>
</tr>
<tr>
<td>Left</td>
<td>-0.2 ≤ x ≤ 0.2 and 0.2 ≤ y ≤ 1</td>
</tr>
<tr>
<td>Right</td>
<td>0.2 ≤ x ≤ 0.2 and -1 ≤ y ≤ -0.2</td>
</tr>
<tr>
<td>Reverse</td>
<td>0.2 ≤ x ≤ 1 and -1 ≤ y ≤ -0.2</td>
</tr>
<tr>
<td>Halt</td>
<td>Any other input</td>
</tr>
</tbody>
</table>

Copyright © 2015 IJIT. All rights reserved.
III. SOFTWARE

The software is used to design and developed is QT creator which is used to make efficient GUI application. Qt Creator is a good example of an application that mixes different user interface technologies. In fact, it uses all of the three different approaches described below. Qt Creator uses the traditional Qt Widgets such as menus and dialogs as a basis of the user interface. Qt Quick amongst others for the welcome screen, and Qt Web Kit for presenting the Qt reference documentation. Qt Creator includes a project manager that uses a cross platform project file format (.pro). A project file can contain information such as what files are included into the project, custom build steps and settings for running the applications. Qt Creator includes a code editor and integrates Qt Designer for designing and building graphical user interfaces (GUIs) from Qt widgets. The code editor can parse code in C++ and QML languages... It is possible to compose and customize the widgets or dialogs and test those using different styles and resolutions directly in the editor. Widgets and forms created with Qt Designer are integrated with programmed code, using the Qt signals and slots mechanism.

IV. HARDWARE

A. ARM9 (Friendly arm mini 2440)

The mini2440 is a practical low-cost ARM9 Single Board Computer (SBC) with a very high performance/cost ratio. With the Samsung S3C2440 microprocessor and the use of professional layout and quality peripheral chips, it is very robust. The Mini2440 uses a four-layer board design with gold immersion processing, and has high quality equal-length bus routing in timing critical areas. The production environment and quality control are the same as those of modern high-speed motherboards. The S3C2440A (450 MHz) offers outstanding features with its CPU core, a 16/32-bit ARM920T RISC processor designed by Advanced RISC machine ltd. The ARM920T implements MMU, AMBA BUS, and Harvard cache architecture with separate 16KB instruction and 16KB data caches, each with an 8-word line length. The S3C2440A minimizes overall system costs and eliminates the need to configure additional components.

B. GSM

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

C. GPS

The Global Positioning System (GPS) is a satellite based navigation system that sends and receives radio signals. A GPS receiver acquires these signals and provides the us with information. Using GPS technology, one can determine location, velocity and time, 24 hours a day, in any weather conditions anywhere in the world for free.GPS was formally known as the NAVSTAR (Navigation Satellite Timing and Ranging). Global Positioning System was originally developed for military. Because of its popular navigation capabilities and because GPS technology can be accessed using small, inexpensive equipment, the government made the system available for civilian use. The USA owns GPS technology and the Department of Defense maintains it.

Merits:

• This system has a unique way of tracking location through GPS.
• GPS system is used to measure latitude and longitude values of the location, so that tracking can be easy.
• GSM used to communicate the nearest hospital and relatives.
• Message to the hospital or care take means immediate aid can be provided without any human intimation.

D. Heart beat sensor

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse. Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

V. RESULTS
When acceleration value is less than 75g and heart rate is below 50/pulse, then system will send message and track the location of impact of elderly people. Also these values will be continuous update over the intranet network such that the user can access the values easily when acceleration value is above threshold values provided above, then system fails to send message because there is no fall event is tracked. So there is less chance for false fall detection rate.

VI. CONCLUSION

This paper reviewed the state of the art in wireless smart home revolution and internet of things (IoT), as presented in the paper smart home wireless sensor networks with IoT technology have the potential to revolutionize the assistive independent living for persons with disabilities and elderly people, as the user can access the data over the web. This paper also proposed a new smart home wireless sensor networks with web, suitable for elders, blind, sight impaired and Alzheimer people specially and for disabled people in general, which called E/D-WSH system. E/D-WSH system offers a complete solution for the whole home environment for elders and disabilities by designing entering system, fall detection system.

VII. REFERENCES


Author’s Profile:
N. Swetha Reddy is working towards a Master of Technology in E.C.E at prestigious K G Reddy college of engineering & technology, Hyderabad, India. She obtained B.Tech from Newton’s institute of engineering and technology.

Pagadala Usha is presently working as an Assistant Professor of ECE Department in prestigious K G Reddy college of engineering & technology, Hyderabad. She obtained M.Tech from VLSI system design at VNR Vignan Jyothi Institute Of Engineering And Technology, Bachupally, Hyderabad. B.Tech degree in electronics and communication engineering from Sree Venkateswara engineering college, jntu, Hyderabad Research interests include digital design and VLSI chip design (ASIC).